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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/783,498

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Li-Shyue Lai

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EXAMINER

CAO, PHAT X

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary

Application No. 10/783,498	Applicant(s) LAI ET AL.	
Examiner Phat X. Cao	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2005.
- 2a) ☒ This action is **FINAL**.
- 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 29-38 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9-11 is/are allowed.
- 6) ☒ Claim(s) 1-8, 29-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-7 and 29-38 are rejected under 35 U.S.C. 102(e) as being anticipated by Johnson (US. 2005/0029503).

Regarding claims 1 and 29-30, Johnson (Fig. 1) discloses a phase change

3. memory cell fabricated on a semiconductor substrate 26 (see abstract), comprising: an insulating dielectric layer 22 on the substrate 26; a thin conductive film 34 (corresponding to the film 34 formed under the layer 38) having a first film thickness on the dielectric layer 22, the plane of the film 34 being generally parallel to the plane of the substrate 26; a layer of a phase change material 36 (par. [0017]) having a second film thickness supported by the dielectric layer 22; and an electrically resistive interface between the thin conductive film 34 and the phase change material layer 36, the interface being defined by an area of engagement between the film 34 and the layer 36 that is generally normal to the plane of the substrate 26, and wherein the thickness of the thin conductive film 34 is less than the thickness of the layer of phase change material 36 at the interface.

Regarding claims 2-3, 5, 33 and 35, Johnson's Fig. 1 further discloses that the width of the conductive film 34 (corresponding to the film 34 formed under the layer 38) generally parallel to the plane of the substrate 26 and the height of the conductive film 34 generally normal to the plane of the substrate 26 determine the area of engagement (claims 2-3 and 35). Therefore, the current path from the interface into the phase change material layer 36 inherently lies in a direction substantially parallel to the plane of the substrate, and the current path from the phase change material layer 36 into the contact 40 inherently lies in a direction generally normal to the plane of the substrate (claims 5 and 33).

It is noted that the electrical resistance of the interface is inversely proportional to the area of engagement (claims 2) because the conductive resistance is inversely proportional to the conductive area. It is also noted that the process limitations recited in a "product by process" claims 3 and 35 (determined by photolithography, by deposition parameters) would not carry patentable weight in a claim drawn to structure because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985).

Regarding claims 4 and 32, because the width of the conductive film 34 is parallel to the plane of the substrate 26, the heat produced by current through the interface would also flow from the interface into the phase change material layer 36 in a direction parallel to the plane of the substrate 26.

Regarding claims 6 and 31, Johnson's Fig. 1 further discloses that the phase change material layer 36 and the thin conductive film 34 are not relatively superjacent or

subjacent, and the conductive material 34 comprises a high band gap and high thermal conductivity material of titanium silicon nitride (par. [0027]).

Regarding claims 7 and 34, Johnson's Fig. 1 further discloses that the phase change material layer 36 resides in a trench formed in the dielectric layer, the bottom surface of the trench and the phase change material layer 36 being below the lower surface of the dielectric layer.

Regarding claim 36, Johnson's Fig. 1 discloses a memory cell, comprising: a layer of phase change material 36; and an elongated thin conductive film 34 (corresponding to the film 34 formed under the layer 38) having one end engaging a side of the layer 36 to define an interface having a width and a height. It is also noted that the process limitations recited in a "product by process" claim (determined non-photolithographically, by thin film deposition parameters)) would not carry patentable weight in a claim drawn to structure because distinct structure is not necessarily produced. In re Thorpe, 227 USPQ 964 (Fed. Cir. 1985).

Regarding claims 37-38, because the width of the conductive film 34 generally parallel to the plane of the substrate and the height of the phase change material layer 36 generally normal to the film 34, the current flows from the interface into the phase change material layer 36 generally parallel to the film 34 and the current flows out of the layer 36 generally normal to the film 34.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

Art Unit: 2814

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson in view of Lowrey (US. 6,673,648).

Johnson does not disclose that the other terminal of the thin film 34 is electrically coupled to an output of the transistor.

However, Lowrey (Fig. 3) teaches a phase change material memory device having an output of the transistor 22 electrically coupling to a phase change memory material 20. Accordingly, it would have been obvious to electrically coupled the other terminal of the thin film 34 of Johnson to the output of the transistor in order to form a phase change memory device, as taught by Lowrey.

Allowable Subject Matter

6. Amended claims 9-11 are allowed.

See reasons of record.

Response to Arguments

7. With respect to claims 1-8 and 29-35, Applicant argues that Johnson does not suggest the invention as amended because the thickness of the thin conductive film 34 is equal to the thickness of the phase change material 36.

It should be noted that the thin conductive film 34 formed on a side of the phase change material 36 and in contact with electrode 40 is not relied on for teaching as "a thin conductive film", but rather, the other thin conductive film 34 formed under the layer 38 is relied on for teaching as "a thin conductive film" as claimed. And clearly, the thin

Art Unit: 2814

conductive film 34 formed under the layer 38 suggests the invention as claimed because it has a thickness being less than the thickness of the phase change material layer 36 at the interface.

With respect to claims 36-38, it appears that Applicant does not traverse the ground of rejections of claims 36-38 because independent claim 36 does not recite the limitation of having the thickness of the conductive film being less than the thickness of the phase change material as argued by Applicant.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is 571-272-1703. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

October 13, 2005



PHAT X. CAO
PRIMARY EXAMINER